Technical Specification Forest Resource Assessment

Mississippi Institute for Forest Inventory
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MISSISSIPPI INSTITUTE
FOR FOREST INVENTORY

Safety Practices

These safety guidelines are to be followed by all personnel representing the Mississippi Institute for Forest Inventory. In addition to the specifications set forth in this manual adherence to the safety policies of cooperating agencies is required. Safety standards for all possible contingencies are beyond the scope of this manual. However, one caveat can be employed that will mitigate most hazards; Think before you act.

Property Access

Although, exemption status is conferred by Statute 49-19-408 all Mississippi Institute for Forest Inventory personnel and authorized contracting agents are required to follow certain proscriptions before entering private or public land. A reasonable and prudent effort is to be made to notify the landowner prior to accessing any property. Under no circumstances are physical barriers to property access to be tampered with or destroyed. Entry into any structure not intended for public use is strictly prohibited. Vehicle access is restricted to public right-of-ways unless specific authorization is obtained from the landowner, this includes the use of off-road vehicles. Persons granted exemption status are not indemnified against civil or criminal penalties involving actions that are outside the scope of their assigned duties. In the event a landowner requests you to leave their premises, you will utilize the information provided by the Mississippi Institute for Forest Inventory in an attempt to enlighten the landowner regarding your duties and secure cooperation. If the landowner is still requesting your departure be cordial and thank them and quietly leave the premises.

Vehicle

All vehicles must be operated in accordance to state and local laws. State owned vehicles must be equipped with a first aid kit and the equivalent of a five pound fire extinguisher. All safety equipment must be in working order. Privately owned vehicles are restricted to operating on clearly visible woods roads and vehicle trails (cross country driving will not be tolerated). When parking vehicles in areas other than maintained roadways caution will be exercised to insure that vegetation or debris can not contact the exhaust system. A walk around the vehicle before moving is recommended to identify any hazards before the vehicle is moved.

Severe Weather

Lightning and excessive winds are the two most hazardous components of thunderstorms. Lightning carries a charge of 100 million volts and heats its immediate area to 60,000 degrees Fahrenheit. An electrical storm does not need to be directly overhead for lightning to strike the immediate vicinity. If a thunderstorm approaches the best place to be is inside a vehicle. If caught in a sudden storm find a depression or

low spot and lie down, this minimizes local elevation peaks created by the body reducing the probability of a lightning strike. Winds with speed in excess of 50 miles per hour poses a hazard by carrying debris that become projectiles. If winds arise that make it difficult to stand still, leave the area and return after they have diminished.

Firearms

At no time is an employee of Mississippi Institute for Forest Inventory allowed to carry firearms while performing their duties unless express consent is granted by their supervisor.

Machete(s)

Because Differential Global Positioning Systems are utilized there is no need for machete(s) to be carried by field personnel for the aid of traversing. Walk around vegetative obstacles.

Field Clothing

Long pants and boots are to be worn at all times when performing inventory duties. Long sleeve shirts in a light color are recommended. A broad rimmed hat is recommended to reduce exposure to ultraviolet radiation.

Terrain Hazards

Common terrain hazards found in Mississippi are abandoned animal burrows that have become covered with litter, marshy areas where siltation creates a quagmire and sloughs and bayous. Check your footing when traversing flatwood areas to avoid stepping into burrows. If the need arises to cross a marshy area, a sounding pole can be used to probe the bottom of shallow areas for secure footing. Never enter water that is deeper than mid-thigh.

Poisonous Snakes

There are six species of poisonous snakes that inhabit Mississippi. These animals will attempt to avoid human contact whenever possible. The highest probability for being bitten occurs when the animal is handled or startled. To avoid being bitten never handle any venomous snake; scrutinize the area closely before sitting or placing your hands into potentially dangerous sites; do not blindly step over fallen logs or other obstacles, step onto the obstacle and look before continuing; do not reach into burrows or dens and watch where you place your feet. There is never a need to kill any snake.

Insects

Although there are two poisonous spiders (Black Widow and Brown Recluse) found in Mississippi the chances are forest inventory crews will not encounter them. However, there are several insects that can be a nuisance and potential health threat. Ticks, red bugs (chiggers) and mosquitoes are the most prevalent of these insects. The best remedy is prevention, by using an insect repellant. Cuffs of pants and shirtsleeves along with the collar should be treated inside and out with the repellant and then exposed skin should be treated. Stinging insects such as bees, wasps and hornets pose a minor nuisance unless the person stung is allergic. Anaphylactic shock is the body's response in severe allergic reactions. The supervisor will be notified by personnel that are susceptible to anaphylaxis before commencing field work.

Poisonous Plants

There are three species of poisonous plants in Mississippi that are of concern to foresters, poison ivy, poison oak and poison sumac. Depending on the severity of the allergy reactions can develop through either direct contact with the plant or exposure to the aromatics released by the plant. Avoidance is the best remedy. In the event of exposure several over the counter treatments are available to reduce the irritation.

Wildlife

There are several animal species that can be harmful to field personnel. Only one course of action can be applied to all encounters. Do not aggravate the animal! In most instances animals will avoid contact with humans provided enough warning. Normal sounds generated while traversing should drive any animals into cover. If you are threatened by an animal be aware that running is the last thing you want to attempt to get away. Slowly retreat from the encounter, facing the animal. Do not climb a tree unless you are certain the animal is not capable of climbing the tree as well. Be especially careful when encountering juvenile animals. Adult animals may not be visible however they are usually situated for an immediate response to the cries of offspring.

Dwellings & Structures

Throughout the state there are many abandoned homesites, natural gas test wells, and other manmade constructs that can be hazards to foresters. Typical among these are shallow wells or cisterns on old homesites. These wells can be choked with debris at the opening that will not support the weight of a cruiser. Old test wells can have noxious fumes emitting from the well or the ground. The best course of action when nearing one of these sites is to offset around it to avoid the hazard completely.

Overhead Dangers

Severe weather damages tree crowns causing branches to be broken and trees to become uprooted. These hazards are often suspended in tree crowns and forest canopies. Extreme caution should be exercised when entering areas where damge of this type might have occurred. They do not call those large branches and leaning trees "widow-makers" for no reason.

Plot Description:

Each plot sampled will be identified with a unique number. The plot number will index all data entered into the field recorder. In addition to plot number, descriptive information for each plot will be entered. Slope, Size Class, Origin, SAF Type, Ownership, Physiographic Position, Logging Operability, Fuel Assessment and Stand Condition will be catalogued within each plot.

Slope - Identifies the average slope for the plot.
Slope observations are made with the hypsometer on a line parallel to the slope.

Stand Condition - Describes the current condition of the stand with respect to damage and harvesting activities. Explicit codes are defined in table 1.

Table 1. Stand level damage categories, descriptions and data code.

Damage Type	Description	Code
Undamaged	There is no apparent damage within the stand.	1
Insect	Infestation of the stand as evidenced by pitch tubes, bore holes, webbed foliage, etc.	2
Disease	Infection of the stand as evidenced by brooming, cankers, conks, etc.	3
Fusiform	Infection of the stand by *Cronartium fusiforme*.	4
Fire	Damage to the boles and/or lower canopy from heat (excluding typical damage from prescribed burns)..	5
Storm	Damage by excessive winds from hurricanes or tornadoes is prevalent (blowdown / windthrow). **(Not to be used this inventory cycle)**	6
Ice	Damage to the upper stems and crowns caused by ice accumulation (breakage in upper crown).	7
Salvage	Focused harvesting operations have occurred within the stand because of some type of localized damage.	8
Thinning	Generalized harvesting has occurred throughout the stand.	9
Clear-cut	The stand has recently been harvested and no routinely used method of regeneration is apparent.	10
Seed Tree	The stand has recently been harvested and seed trees for regeneration are present.	11
Animal	Direct or indirect damage caused by animal activity	16
Light Crown	Breakage of branches less than one-half (0.5) inch in diameter.	17
Moderate Crown	Breakage of branches greater than one-half (0.5) and less than three (3.0) inches in diameter.	18

Heavy Crown	Breakage of branches greater than three (3.0) inches in diameter and possible shearing of forks.	19
Lean	Trees exhibit a pronounced tilting from the vertical prevalent throughout the stand.	20
Blowdown	Tree stem is intact but laying on the ground with the root system attached.	21
Shear	Stems have been sheared or twisted off with no crown material present above the break.	22

Size Class - Classifies the merchantability class for the plot based on overall size composition. The predominate size class encountered on the plot defines the size class. Table 2 lists acceptable size class designations.

Table 2. Plot merchantability classes, class description and data code for plot size class.

Size Class	Class Description	Code
Reproduction	No commercial tree species greater than 1 inch in d.b.h. are encountered within the radius of a 1/5th acre plot (excludes seed-tree stands).	1
Sub-Merchantable	No commercial tree species greater than 4.5 inches in d.b.h. are encountered within the radius of a 1/5th acre plot.	2
Pulpwood	The majority of commercial tree species occupying the 1/5th acre plot are 4.6 to 10.6 inches in d.b.h.	3
Pallet	The majority of commercial hardwood stems occupying the 1/5th acre plot are 7.6 to 10.5 inches d.b.h.	4
Chip'n Saw	The majority of commercial pine stems occupying the 1/5th acre plot are 7.6 to 10.5 inches in d.b.h	5
Saw timber	The majority of commercial tree species occupying the 1/5th acre plot are greater than 10.6 inches in d.b.h.	6
Non Timber	The site has been converted to a non-forestry application.	7
Non Stocked	There is less than 20 square feet of basal area on a 1/5th acre plot.	8

Origin - Identifies the origin of the stand. Table 3 identifies acceptable origin codes.

Table 3. Origin (regeneration method) categories, category description and data codes.

Origin	Description	Code
Natural	Regeneration occurred from natural processes.	1
Planted	Regeneration occurred from planted stock.	2
Undetermined	Regeneration method is not readily apparent.	3

SAT Code - Identifies the canopy coverage in a broader perspective than the SAF cover-type. Table 4 provides guidelines for defining SAT codes.

Table 4. SAT categories, category description and data codes.

SAT Codes	Description	Code
Hdwd	Canopy composition is less than 20% coniferous.	1
Mixed	Canopy composition is between 40% and 60% coniferous.	2
Pine	Canopy composition is greater than 80% coniferous.	3
Hdwd-Damaged	Canopy composition is less than 20% coniferous and exhibits damage that has been recorded.	4
Mixed-Damaged	Canopy composition is between 40% and 60% coniferous and exhibits damage that has been recorded.	5
Pine-Damaged	Canopy composition is greater than 80% coniferous and exhibits damage that has been recorded.	6

SAF Cover-Type - Identifies the canopy species composition using SAF accepted cover types. There are 35 separate cover types that can be encountered. For the inventory, the definitive guide is "Forest Cover Types of the United States and Canada" published by the SAF (1980). Abbreviated descriptions are included with the code designations in Table 5.

Table 5. SAF Cover Type Definitions.

Cover Type	Description	Code
Lob-Short	Loblolly and shortleaf pine together comprise a majority of the stocking, although the proportion of each varies, loblolly is usually dominant.	1
Loblolly	Comprised of either pure stands of loblolly pine or mixtures in which loblolly makes up the majority.	2
Shortleaf	Shortleaf provides the majority of stocking but is rare except in young stands or on very dry sites.	3
Lob-Hdwd	Loblolly is not dominant but provides 20 percent or more of the stocking in mixture with hardwoods.	4
Short-Oak	Shortleaf is not dominant but provides 20 percent or more of the stocking in mixture with oaks.	5
Long-Slash	Longleaf and slash pine make up a majority of the stocking with slash being subordinate to longleaf.	6
Longleaf	Longleaf pine is pure or comprises a majority of the trees in the overstory.	7
Slash	Slash pine is pure or comprises a majority of the stocking.	8
Long-Scrub	Longleaf pine and scrub oaks comprise this typically younger type.	9
Slash-Hdwd	Slash pine and a variable mixture of hardwoods comprise the majority of the stocking.	10

ERC-Hdwd	Eastern redcedar and mixed hardwoods comprise the majority of stocking with varying proportions.	11
ERC	Eastern redcedar is pure or comprises the majority of the stocking.	12
S. Scruboak	Type consists of a mixture of scrub oaks where fire has been excluded not allowing longleaf regeneration.	13
Oak-Pine	Various oaks dominate the stocking with pine comprising less than 20 percent.	14
Oak-Hick	Oaks and hickories are prevalent throughout the stocking.	15
PO-Blkjck	Post oak and blackjack oak comprise the majority of the stocking.	16
White Oak	White oak dominates the stocking with other components less than 20 percent.	17
WO-RO-Hick	White and red oaks dominate the canopy with stocking levels varying among the species.	18
YP-WO-RO	Yellow poplar, white oak and red oak together comprise the majority of the stocking.	19
SG-YP	Sweetgum and yellow poplar comprise the majority of the overstory and the stocking.	20
O-G-C	Oaks, gums and cypress comprise the majority of the stocking with varying percentages of composition.	21
SCO-Chrybk	Swamp chestnut oak and cherrybark oak constitute a majority of the stocking.	22
SG-WiO	Sweetgum and willow oak comprise a majority of the stocking with sweetgum being dominant to willow oak.	23
SB-AE-GA	Sugarberry, elm and ash constitute a majority of the stocking. Sugarberry is replaced by hackberry in the northern part of the range.	24
OvO-Hick	Overcup oak and hickory make up a majority of the stocking.	25
Cyp-Tup	Cypress and tupelo together comprise the majority of the stocking.	26
Swb-STu-Rb	Combinations of sweetbay, tupelo and redbay, with sweetbay dominant, make up the majority of stocking.	27
WiO-WaO-LO	Willow oak, water oak and laurel oak in varying proportions comprise a majority of the stocking.	28
Live Oak	Live oak is pure or the majority of stocking.	29
Cyp	Cypress is pure or comprises a majority of the stocking.	30
Tup	Tupelo is pure or constitutes a majority of the stocking.	31
CotWood	Cottonwood is pure or comprises a majority of the stocking.	32
Syc-SG-AE:	Sycamore, sweetgum and elm together comprise a majority of the stocking with varying proportions.	33
Willow	Willow species comprise a majority of the stocking.	34
NonStock	Naturally occurring land areas excluding agricultural lands and pastures that are devoid of tree species.	35

Ownership -Identifies the primary ownership entity. Identification of ownership is not paramount to performance of the inventory. Minimal time should be spent discerning this variable. If ownership is obvious then identification should be made. Table 6 depicts the 10 categories that will describe all ownership possibilities.

Table 6. Land ownership categories, category description and data codes.

Ownership	Description	Code
Private Non-Industrial	Acreage that does not appear to be intensively managed for forestry.	1
Industrial	Acreage that has the appearance of intensive management for forestry.	2
USFS	Acreage that is owned or operated by the USDA Forest Service.	3
USFWS	Acreage that is owned or operated by the USDI Fish and Wildlife Service.	4
Other Fed	Acreage that is owned or operated by any other federal entity including BLM, National Park Service, etc.	5
State Gov	Acreage that is owned or operated by the State, including state parks, 16th section land, etc.	6
Municipal	Acreage that is owned or operated by municipalities including city parks, public golf courses, etc.	7
Urban	Acreage that is owned or dwelled upon for residential purposes including subdivisions, private golf courses, etc.	8
Tribal	Acreage that is owned or operated by federally recognized Native American tribes including Choctaw, Chickasaw, etc.	9
Unknown	Acreage that ownership cannot be readily identified.	10

Physiographic Position - Classifies the geographic position of the plot. Table 7 supplies descriptions that will define relative position. Strict definitions are not applicable to identify physiographic position because of the variability experienced state wide.

Table 7. Topographic position categories, category description and data codes.

Physiography	Description	Code
Upland	Drier, xeric sites found on top of ridges and side slopes.	1
Bottom	Wet, hydric sites found along rivers and streams.	2
Terrace	Mesic sites that by default are not upland or bottom.	3

Logging Operability - Classifies the terrain for season and equipment accessibility. Table 8 lists the applicable designators for logging operability.

Table 8. Logging operability categories, category description and data code.

Logging Operability	Description	Code
Year Round	Accessible to logging equipment throughout the calendar year.	1
Summer/Fall	Accessible to logging equipment during these seasons only.	2
Crawler	Soil or slope precludes the use of rubber tired skidders.	3
High Lead	Cable harvesting systems are required.	4
Inoperable	Cannot be harvested economically or efficiently.	5

Latitude / Longitude - In the event that a plot locations has to be moved from the preset coordinates this specifies the reason that the plot was repositioned.

Fuel Assessment:

Each plot will represent a point estimate of the potential for wildfire ignition and spread. An ocular estimate of the fuel loading present will be made utilizing the Fire Behavior Fuel Model Key associated with the S-390 Fire Behavior Course developed by the USFS. In addition to the fuel model assessment a physical measurement of the litter layer will be made immediately after plot establishment.

Table 9. Fuel Loading model determination descriptions

Fuel Model	Description	Code
ShortGrass	Grasslands that are not grazed less than 3 feet tall.	1
GrassLitter	Short grass under an open tree canopy with minimal deadfall.	2
TallGrass	Grasslands with average vegetation height greater than 3 feet.	3
ShortBrush	Shrubs less than 6 feet tall with no timber overstory.	4
BrushHDWD	Shrubs less than 6 feet tall with hardwood timber overstory.	5
BrushPine	Shrubs less than 6 feet tall with pine overstory.	6
Litter	Closed timber canopy (pine or hardwood) with extremely sparse understory.	7
Deadfall	Over mature timber overstory with understory and significant deadfall present.	8
LightSlash	Slash highly scattered and spotty as found with minimal salvage operations.	9
Mod.Slash	Slash is evenly distributed as found with typical thinning operations.	10
HvySlash	Slash is evenly distributed but comprised of larger diameter material as found with clearcut operations.	11

Plot Measurements:

A 1/5th (0.20) acre plot with a radius of 52.7 feet is utilized to sample merchantable sawtimber, veneer or peeler material, poles, chipn'saw and pallet timber (6.6 inches in d.b.h. and larger). A 1/10th (0.10) acre plot as described by ½ of the plot as measured from due north to due south in a clockwise direction is used to inventory pulpwood sized trees (4.6 inches in d.b.h. and larger). A 1/20th (0.05) acre plot as described by 1/4 (one-quarter) of the plot as measured from due north to due east is used to inventory sub-merchantable trees between 1 and 4.5 inches in d.b.h. A 1/100th (0.01) acre plot with a radius of 11.8 feet is used to record regeneration 0.0 to 1 inch in d.b.h. Regeneration plots are only established on locations where the "Size Class" is designated "Reproduction." Sweeps will start and stop on the radial line with a north azimuth to ensure there are no duplicate tallies.

Individual Tree Tally:

Each live tree will have the following observations recorded. Product, species, d.b.h., total height, pulpwood height to an absolute top, saw timber height to an absolute top, height to base of live crown, apparent damage and broken top diameter$_{ob}$ if present.

Plot: The unique number assigned to this particular set of Latitude / Longitude coordinates.

Product: Describes the primary merchantability of the stem. Table 9 defines the specifications for the product classes.

Table 9. Product merchantability categories, category description and data code.

Product Category		Description	Code
Reproduction		All commercial species that are less than 1.0 inch d.b.h. These trees are tallied according to height class.	1
	Class 1	Commercial species less than 1 foot in height.	
	Class 2	Commercial species between 1 and 3 feet in height.	
	Class 3	Commercial species greater than 3 feet in height.	
Sub-merchantable		All commercial species that are between 1 and 4.5 inches d.b.h. Total height for these trees is estimated to the nearest foot.	2
Pulpwood		All commercial species that are 4.6 inches d.b.h. or greater that do not meet the qualifications for a product of greater value.	3
Chip'n Saw		Pine species that are 7.6 - 10.5 inches d.b.h. and have a minimum of 16 feet from the butt to a 6 inch top.	4
Pallet Lumber		Hardwood species that are 7.6 - 10.5 inches d.b.h. and have a minimum of 16 feet from the butt to a 6 inch top of sufficient quality to be comparable to pine chip'n saw.	5

Saw Timber	Pine species that are 7.6 inches d.b.h. or greater and broadleaf species that are 11.6 inches d.b.h. or greater and of sufficient quality to be utilized as saw timber.	6
Peeler	Trees that are 15.6 inches d.b.h. or greater and have 16 feet of clear butt log.	7
Pole	Trees that are 11.6 inches d.b.h. or greater free of defect and sweep. Restricted to pine species (longleaf and slash) predominately found in southern coastal plain.	8
Railroad Tie	Hardwood species (red and white oaks) that are not suitable for saw timber but higher quality than pulpwood.	9
Cull	Any tree that has obvious defects that preclude its inclusion in any of the other product classifications (i.e. large areas of decay, very poor form, etc.)	10
Height Sample	The first two non-cull trees (merchantable) tallied on each plot are carefully measured for all pertinent heights. This sample is taken after the reproduction plot information is recorded. Heights are measured by the same individual that estimated heights.	11
Growth Sample	This is the product used to indicate that growth information has been recorded for this tree.	12
Site Sample	This is the product used to indicate that site index information has been recorded for this tree.	13

Species: A numeric code from 1 - 60 that identifies the species of the tree. The predominant commercial species are assigned a code to be input. Additionally, genus codes are supplied in the event that species identification is not possible. Table 10 supplies the code, common name and species name.

Table 10. Common Name - Species Reference

Common Name	Species Name	Code
Misc. Pine	*Pinus spp.*	1
Loblolly	*Pinus taeda*	2
Shortleaf	*Pinus echinata*	3
Longleaf	*Pinus palustris*	4
Slash	*Pinus elliotii*	5
Cypress	*Taxodium spp.*	6
E. Red Cedar	*Juniperus virginiana*	7
Other Red Oak	*Quercus spp. erythrobalanus*	8
Cherrybark Oak	*Quercus pagodifolia*	9
Shumard Oak	*Quercus shumardii*	10
Black Oak	*Quercus velutina*	11
Nuttall Oak	*Quercus nuttallii*	12
Red Oak	*Quercus falcata*	13
Blackjack Oak	*Quercus marilandica*	14
Turkey Oak	*Quercus laevis*	15
Other White Oak	*Quercus spp. leucobalanos*	16
White Oak	*Quercus alba*	17
Post Oak	*Quercus stellata*	18
Swamp Chestnut/Cow Oak	*Quercus prinus*	19
Overcup Oak	*Quercus lyrata*	20
Durand Oak	*Quercus durandii*	21
Water Oak	*Quercus nigra*	22
Willow Oak	*Quercus phellos*	23
Laurel Oak	*Quercus laurifolia*	24
Chinkapin Oak	*Quercus muehlenbergil*	25
Live Oak	*Quercus virginiana*	26
Sweetgum	*Liquidambar styraciflua*	27
Ash	*Fraxinus spp.*	28
Sycamore	*Platanus occidentallis*	29

Common Name	Species Name	Code
Yellow/Tulip Poplar	*Liriodendron tulipifera*	30
Tupelo	*Nyssa aquatica*	31
Blackgum	*Nyssa sylvatica*	32
Sugarberry / Hackberry	*Celtis spp.*	33
Hickory	*Carya spp.*	34
Pecan	*Carya Illinoensis*	35
Walnut	*Juglans spp.*	36
Cottonwood	*Populus deltoides*	37
Basswood	*Tilia spp.*	38
Black Cherry	*Prunus serotina*	39
Persimmon	*Diospyros virginiana*	40
Sassafras	*Sassafras albidum*	41
Magnolia	*Magnolia spp.*	42
Maple/Boxelder	*Acer spp.*	43
Willow	*Salix spp.*	44
Elm	*Ulmus spp.*	45
Beech	*Fagus spp.*	46
Birch	*Betula spp.*	47
Dogwood	*Cornus spp.*	48
Red Bay	*Persea borbonia*	49
Holly	*Ilex spp.*	50
Mulberry	*Morus spp.*	51
Locust	*Robinia/Gleditsia spp.*	52
Osage Orange	*Maclura pomifera*	53
Hornbeam	*Carpinus/Ostrya spp.*	54
Redbud	*Cercis canadensis*	55
Catalpa	*Catalpa bignonioides*	56
Exotics	*Albizia / Sapium / Paulownia spp.*	57
Other Hard Broadleaf	*Crataegus / Chionanthus spp.*	58
Other Soft Broadleaf	*Foresteria / Aralia spp.*	59
Unknown		60

Diameter: The diameter of the stem, at breast height, to the nearest inch. Diameter is measured at 4.5 feet above ground level on the uphill side of the stem. If there is a deformity at d.b.h. then diameter is preferably measured 1 foot above the point where the stem resumes normal growth. If this point is inaccessible then the diameter is measured 1 foot below the point where the abnormality occurs. If the stem forks (visible separation) below d.b.h. then each of the multiple stems are treated as separate trees and measurements are taken at d.b.h. If the stem (visible separation) forks at or above d.b.h. then the stem is treated as a single tree and the diameter is taken at the base of the fissure scar. If the tree exhibits excessive butt swell as usually encountered with cypress and gum species then the diameter is measured 1 foot above the point where the stem resumes normal form. Parasitic vegetation (clinging vines, etc.) should be removed to assure that only the tree diameter is measured. This diameter is measured to the nearest 1/10th inch on the height sub-sample trees and any tree that has been sheared off due to wind or mechanical damage where the portion of the stem at dbh is still present.

Stump Diameter: Because of special circumstances created by Hurricane Katrina the necessity to measure stump diameters has arisen. A stump is defined as the portion of the stem remaining in the ground after the upper portion of the stem has been removed by application of a mechanical device(e.g. chainsaw, rotary cutter head, hydraulic shear, axe, etc.) The diameter is obtained the same way that diameter at breast height by using a diameter tape or caliper. This diameter is measured to the nearest 1/10th inch on the height sub-sample trees and any tree that has been sheared off due to wind or mechanical damage.

Total Height: The height of the tree (nearest foot) to meristematic tip or uppermost leader. Most conifers will exhibit one stem terminating with an apical meristem. If the main stem is intact, then height is measured to the apical tip of the tree. If the main stem has been damaged, then height is measured to the point where the breakage occurs. Broadleaf trees typically do not possess a single upper stem. They will however usually have a dominant leader. If a dominant leader can be identified then height is measured to its tip. If the top has been broken out then height is measured to the point of breakage on the largest diameter limb.

Pulpwood Height to Absolute Top: For conifer species, the height where the main stem is 3 inches DOB; for broadleaf species, the height where the main stem or largest diameter limb is 4 inches DOB (nearest foot). This height is recorded for both pulpwood and saw timber trees

Saw timber Height to Absolute Top: For conifer species, the height where the main stem is 6 inches DOB; for broadleaf species, the height where the main stem is 10 inches DOB (nearest foot).

Base of Live Crown: The height where the convergence of the lowest limb that makes a significant contribution to the total crown foliage volume intersects the main stem of the tree.

Damage: Table 11 provides damage categories that will be used to relate tree level damage assessments.

Table 11. Tree level damage categories, descriptions and data code.

Damage Type	Description	Code
Undamaged	The tree displays no apparent damage.	1
Insect	Infestation of the tree as evidenced by pitch tubes, bore holes, webbed foliage, etc.	2
Disease	Infection of the tree as evidenced by brooming, cankers, conks, etc.	3
Fusiform	Infection of the tree by *Cronartium fusiforme*.	4
Fire	Damage to the bole and/or lower canopy from heat (excluding typical damage from prescribed burns)..	5
Storm	Damage by excessive winds from hurricanes or tornadoes is prevalent (blowdown / windthrow).	6
Ice	Damage to the upper stem and crown caused by ice accumulation (breakage in upper crown).	7
Mechanical	Damage caused by human activity.	12
Decay	Decay of portions of the tree due to exposure.	13
Lightning	Direct strikes evidenced by spiraling scars on the stem.	14
Erosion	Exposure of root system by flowing water or wind removal of soil.	15
Animal	Direct or indirect damage caused by animal activity	16
Light Crown	Breakage of branches less than one-half (0.5) inch in diameter.	17
Moderate Crown	Breakage of branches greater than one-half (0.5) and less than three (3.0) inches in diameter.	18
Heavy Crown	Breakage of branches greater than three (3.0) inches in diameter and possible shearing of forks.	19
Lean	Trees exhibit a pronounced tilting from the vertical prevalent throughout the stand.	20
Shear	Stems have been sheared or twisted off with no crown material present above the break.	21

Broken Top: The stem diameter$_{ob}$ where the break occurs. For broadleaf species this is defined where the largest diameter stem has been broken.

Height Sub-Sample:

The first two merchantable trees tallied and marked are measured with the hypsometer for total, absolute and crown heights and all other attributes including stump diameter. **The measurements are to made by the same individual that estimated the**

heights. Under no circumstances are height sub-sample measurements performed prior to height estimations for the plot tally.

Growth Projection Measurements:

If present two merchantable trees and one sub-merchantable tree representing the dominant species present will be sampled for growth at each plot. The merchantable trees closest to plot center that are of good form and part of the dominant or codominant canopy layers will be sampled. A sub-merchantable tree capable of supplying a 5 year radial growth increment will also be sampled. For each tree record the species, d.b.h. to the nearest tenth-inch, single bark thickness, and 5 and 10 year radial growth increment. **Do not collect growth measurements for non-commerical species including hickories.**

Site Index Measurements:

On all sites a dominant or co-dominant tree is sampled. On hardwood sites, if a pine species is present then site index measurements are made for one dominant or codominant pine tree as well as a dominant or codominant hardwood species, provided the tree is either dominant or codominant with respect to crown class. Record the species, d.b.h. to the nearest tenth-inch, age at breast height and, utilizing the hypsometer, total height. **Do not collect site index measurements for non-commercial species including hickories.**

Invasive Species:

At all plot locations a determination for the presence of invasive species will be made. The following table lists the invasive species that are of high concern to the Mississippi forestry community. In addition to indicating the presence of the invasive specie the degree to which an individual specie is present will also be indicated. In the case of the Chinese Tallow and Mimosa tree measurements will be made identical to the measurements for commercial species. For the non tree form species a percentage estimate of the area of the plot will be made.

Table 12. Priority Invasive species in Mississippi.

Common Name	Species Name	Code
Chinese Tallow	*Triadica sebifera*	1
Kudzu	*Pueraria montana*	2
Cogon Grass	*Imperata cylindrica*	3
Japanese Climbing Fern	*Lygodium japonicum*	4
Japanese Wisteria	*Wisteria floribunda*	5
Privet	*Ligustrum spp.*	6
Mimosa	*Albizia julibrissin*	7
Japanese Honeysuckle	*Lonicera japonica*	8

Plot Procedures

Establishing plot center is the most critical aspect of this entire endeavor. The uniformity of the stand determines whether plot center is located where the GPS indicates or whether plot center is moved. There is one exception to this rule. In the event that a plot is being located in a damaged stand that plot is set where the GPS indicates. This is true whether the timber has been removed from the stand or not (this means that if you are standing in a salvage clearcut with fresh stumps you take the plot where it lands). The minimum information required for individual tree measurements on these plots includes the species and stump diameter or species, product, and dbh. If there is standing timber this is measured according to standard procedure.